

How should
Climate Change Uncertainty
Impact

Social Valuation and Policy?

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Application based on joint work with Barnett and Brock

An uncertain world

- ▷ people, businesses, and governments all cope with uncertainty
- ▷ economic model builders, statisticians and decision theorists seek to formalize constructive ways to embrace this uncertainty

I will discuss uncertainty in broad terms and feature its implications in conjunction with climate change

Climate uncertainty



“Climate change is the Tragedy of the Horizon. With better information as a foundation, we can build a virtuous circle of better understanding of tomorrow’s risks, better pricing for investors, better decisions by policymakers, and a smoother transition to a lower-carbon economy.”

Mark Carney (2015)

Pretense of knowledge



“Even if true scientists should recognize the limits of studying human behaviour, as long as the public has expectations, there will be people who *pretend* or *believe* that they can do more to meet popular demand than what is really in their power.”

Hayek (1974)

Growth rate uncertainty

Sources of uncertainty that are **difficult** to quantify probabilistically with **full confidence**:

- ▷ macroeconomists speculate about the potential permanence of **secular stagnation**
- ▷ economic historians debate the future of **technological progress**
- ▷ geoscientists explore the possible quantitative consequences of **fossil fuel emissions** on climate change
- ▷ environmental economists make conjectures about how **climate change** could alter growth

I will focus on the last two and their interactions.

Keynes and Knight



Uncertainty must be taken in a sense radically distinct from the familiar notion of *Risk*, from which it has never been properly separated.... and there are far-reaching and crucial differences in the bearings of the phenomena depending on which of the two is really present and operating.

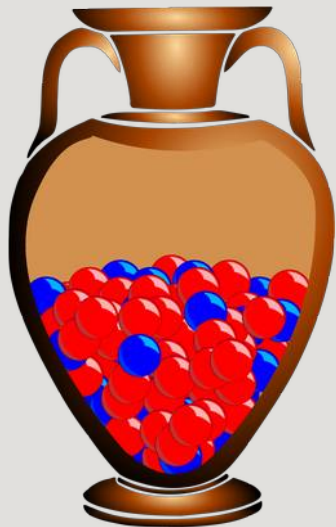
Knight (1921)



We have, as a rule, only the *vaguest* idea of any but the most direct consequences of our acts... Our knowledge of the future is *fluctuating*, vague, and *uncertain*.

Keynes (1937)

Uncertainty can be *risk*



75 Red Balls

25 Blue Balls

Uncertainty can be *ambiguity*



? Red Balls

? Blue Balls

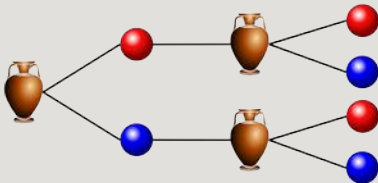
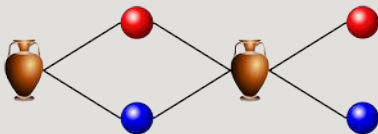
Uncertainty can *change over time*



? Red Balls

? Blue Balls

Compounding uncertainty



Subjective probability



"Subjectivists should feel obligated to recognize that any opinion (so much more the initial one) is only vaguely acceptable...So it is important not only to know the exact answer for an exactly specified initial problem, but what happens changing in a reasonable neighbourhood of the assumed initial opinion."

De Finetti

Letting evidence speak



The facts **do not speak** for themselves.
They need all the abstract, theoretical
help they can get.

Lucas (1985)

See also CBR: Purely evidence-based policy doesn't exist by Lars
Peter Hansen

Dangers of Being Naive



The Cheat Georges de La Tour

Where does uncertainty emerge?

Quantitative storytelling with multiple stories

- ▷ **risk**: each model has **random impulses** and requires numerical inputs
- ▷ **ambiguity**: multiple models give rise to multiple “stories” with **different implications**
- ▷ **misspecification**: each model is an **abstraction** and not intended to be complete descriptions of reality

Navigating uncertainty

Probability models we use in practice are **misspecified**, and there is **ambiguity** as to which among multiple models is the best one.

- ▷ Aim of **robust** approaches:
 - use models in **sensible ways** rather than discard them
 - use probability and statistics to provide tools for limiting the type and amount of uncertainty that is entertained
- ▷ aversion - **dislike** of uncertainty about probabilities over future events
- ▷ implementation - **target** the uncertainty components with the **most adverse consequences** for the decision maker

Uncertainty tradeoff

Use mathematical models informed by expert judgement and empirical evidence to:

- ▷ make **best guesses**
- ▷ determine **potentially bad outcomes**

How much attention do we pay to best guesses versus possible bad outcomes when making decisions including constructing investment strategies and designing policy?

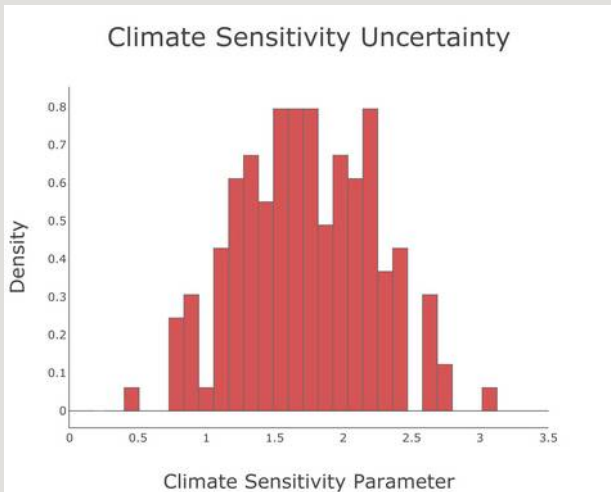
Social cost of carbon (SCC)

Commonly referred to in policy discussions but **meanings** and **targets** of measurement *differ* across applications.

We use a well-posed version as an **analytical tool** to assess the impact of uncertainty.

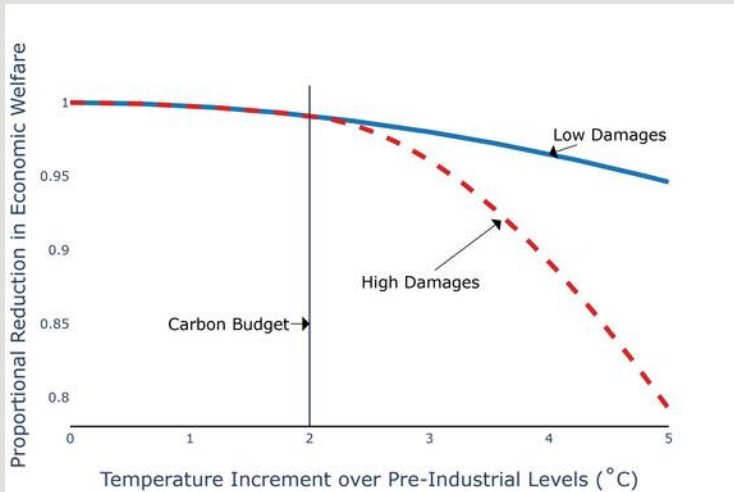
- ▷ **externality** - carbon **emissions** alter the **climate** which in turn impacts economic **opportunities** and social well-being in the future - not captured by market prices
- ▷ **social cost of carbon** includes the socially efficient (Pigouvian) tax on carbon emissions that “**corrects**” this “**externality**”

Climate sensitivity uncertainty

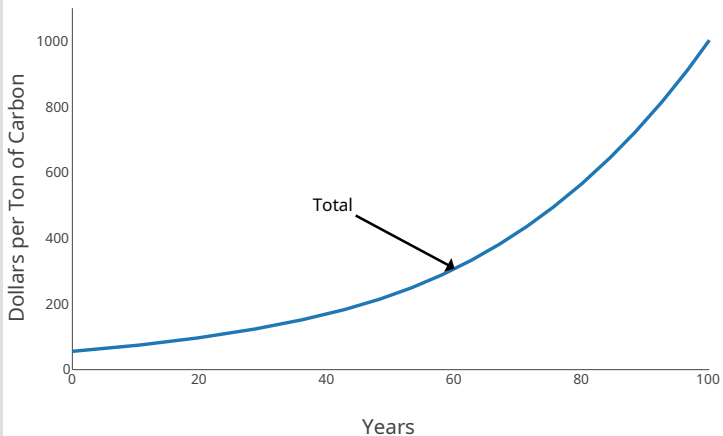


Histograms and density for the climate sensitivity parameter across models. Evidence is from MacDougall-Swart-Knutti (2017).

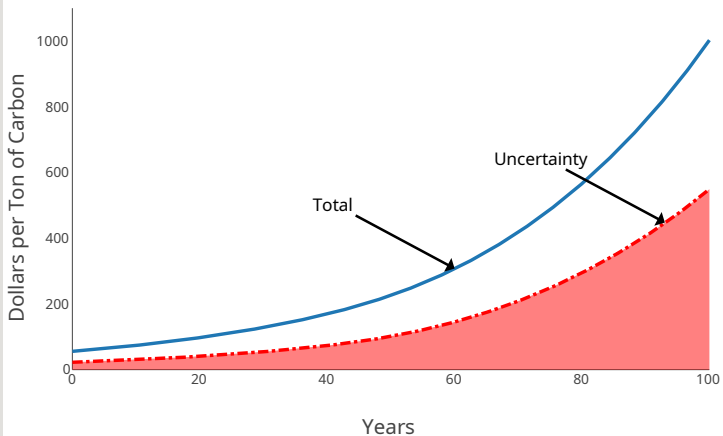
Proportional damage uncertainty



Social Cost of Carbon Decomposition



Social Cost of Carbon Decomposition



Private sector uncertainty

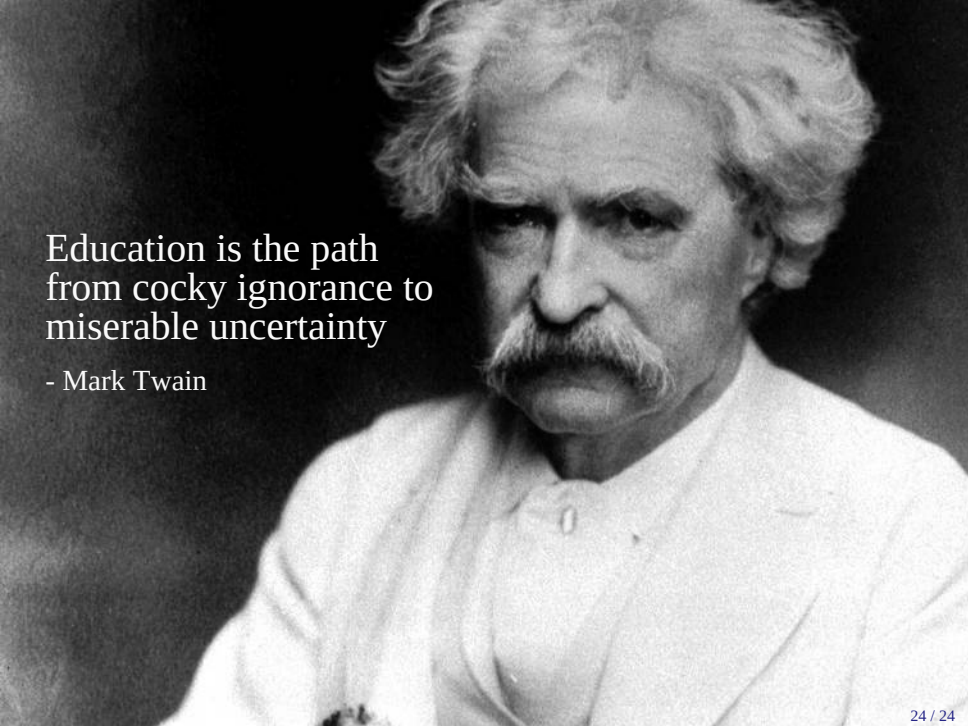
- ▷ **fundamental uncertainty**: what is the magnitude of climate change and over what time horizon?
- ▷ **policy uncertainty**: what type of policy making will be put in place and when?

Future responses to climate change



Opens additional channels with uncertain consequences

- ▷ **Energy transition:** accelerating the shift away from fossil fuels and towards renewable energy
- ▷ **Nature-based solutions:** increasing sink capacity and enhancing resilience within and across forestry, agriculture, oceans and food systems
- ▷ **Adaptation:** advancing global efforts to address and manage the impacts and uncertainty of climate change

A black and white portrait of Mark Twain, showing him from the chest up. He has white, wavy hair and a prominent white mustache. He is wearing a light-colored, high-collared shirt. The background is dark and out of focus.

Education is the path
from cocky ignorance to
miserable uncertainty

- Mark Twain